

CHECK-LISTS AND CLECOM: A RESPONSE TO DAVIS (2004)

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Recently, Davis (2004) published a paper with the title “Species check-lists: death or revival of the Nouvelle École?”. From his title it is clear that he considers the work of CLECOM as the revival of the Nouvelle École (since a “death” of that school – whatever it means – would not be worth mentioning). This is a serious indictment, and therefore we have taken the liberty to explain some of our work in a more detailed manner.

CLECOM

The acronym CLECOM stands for “Check-List of the European Continental Mollusca”. The initiative dates back to June 1986, and in August 1995 the CLECOM Working Group was officially endorsed by the General Assembly of Unitas Malacologica (UM) at its 12th International Malacological Congress in Vigo, Spain. The CLECOM Working Group acts under the umbrella and on behalf of UM; the Friedrich-Held-Gesellschaft (München) is the organisation responsible for the CLECOM Working Group (Falkner et al., 2001).

One of the primary aims of the CLECOM initiative is to produce a distributional check-list of accepted scientific names for all the non-marine molluscan (sub)species recognised in Europe. The first CLECOM list covers northern, western and central Europe (Falkner et al., 2001). The second CLECOM list gives a supraspecific classification of the European non-marine molluscs (Bank et al., 2001a). The third CLECOM list covers Macaronesia (Bank et al., 2002). The lists have been welcomed by many malacologists. In fact, recent works have adapted their nomenclature/classification to a large extent to the CLECOM lists (e.g., Alba et al., 2004; Glöer, 2002; Martínez-Orti & Robles, 2003; Moorkens & Speight, 2001; Olsen, 2002; Šteffek & Grego, 2002; Vilella et al., 2003). By doing so, a much more uniform

nomenclature becomes available within the malacological community: regional scientific names, that are still hampering communication approximately 250 years after Linnaeus, are more difficult to defend now. This will favor integration, for example, among databases. One such database is a product of the Fauna Europaea project (www.faunaeur.org), and uses the CLECOM lists as its basis for the Gastropoda.

Although there have been some cautionary comments regarding use of the CLECOM lists (e.g., Cameron, 2003), we have the impression that a certain level of traditionalism is involved. For example, Cameron (2003) still uses the name *Oxyloma pfeifferi* despite the fact that the epithet *pfeifferi* Rossmässler, 1834, has been replaced for taxonomic reasons by the older name *elegans* Risso, 1826, for nearly half a century (Forcart, 1956; see also ICZN Opinion 336, 1955). It is difficult to find a paper published by a non-British or non-Scandinavian malacologist after 1970 that uses the name *pfeifferi*. Davis (2004), however, questioned the scientific basis of the CLECOM lists as a whole. Although his criticism is only very general, we would like to respond to his comments.

Organismal and Molecular Taxonomists Should Combine Their Forces in Biodiversity Research

People have marvelled and puzzled over morphological diversity for thousands of years. According to Wheeler (2004) we now have the opportunity to put centuries of scholarship on morphology into perspective and share it with the world. One tool for achieving this is the preparation of species check-lists, which should be considered snapshots of our knowledge of the world's biodiversity at a given moment. Such check-lists are often needed

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to attain an overview of the data available in the ever increasing taxonomic and faunistic literature. In fact, check-lists and bibliographies often boost research, as they provide insight on the status of current knowledge.

Most of the taxonomic and faunistic literature is based on morphological studies. Professionals and amateurs make lists of species from particular locations by identifying species mostly with a field guide based on observable morphology. According to Davis (2004: 228), "creating taxa simply on the basis of shell characters (qualitative and quantitative) should always be done with extreme caution". He even states that "the situation may not substantially change even when other characters, anatomical, eco-ethological are added". Davis is advocating molecular research as the Holy Grail. This approach to biodiversity/systematics is a subject of serious concern (Lee, 2004; Wheeler, 2004; Will & Rubinoff, 2004; Wiens, 2004). We advocate that all disciplines of taxonomy should combine their forces to decipher evolutionary processes rather than each stressing its own superiority. What we do not advocate is the training of biologists who can only identify organisms after grinding them up and feeding them into a sequencing machine.

Sequences, although highly informative, are not *a priori* better than morphological, anatomical or eco-ethological characters. An example is the recently published molecular phylogeny of the western palaearctic Helicidae *sensu lato* (Steinke et al., 2004). The maximum likelihood phylogenetic tree (based on a combined dataset of COI, 16S, 18S and ITS-1 sequences) fits almost perfectly with the family/subfamily classification provided by CLECOM, a classification based on anatomical data. Where more than one species per genus was sampled, these genera were monophyletic. An exception was the nominal genus *Cernuella*, as the three species that were sequenced – *virgata*, *neglecta* and *cespitem* – are scattered within the phylogenetic tree of the Hygromiidae. Had the authors consulted the CLECOM check-list, they would have learned that *cespitem* is not a *Cernuella*, but belongs to the genus *Xerosecta*, subgenus *Xeromagna*, and that *neglecta* and *virgata* belong to different subgenera (*Xerocincta* and *Cernuella*, respectively) of the genus *Cernuella*. Unfortunately, scientists working with molecules often use old taxonomic frameworks in their publications.

Naming Species and the Biological Species Concept

Species concepts have been the subject of voluminous debate. We adhere to the biological species concept (BSC), although we admit that most of the entities that are currently recognized in malacology as "good species" are in fact morphospecies. It is widely accepted, however, that the vast majority of the currently accepted morphospecies correspond to biological species. In fact, we are not aware of any example in malacology of widely accepted morphospecies recognized half a century ago as living in Europe now being lumped together as a result of more "sophisticated" studies involving, for example, population genetics or molecular data. In fact, such studies often revealed higher diversity than was expected on morphological criteria, for example, because of the presence of cryptic species. The number of taxa in check-lists presented as "good species" should therefore be considered conservative rather than exaggerated.

Care should be taken with the doctrines known as the "Nouvelle École" of Bourguignat or "Starobogatovism". Practitioners of both doctrines should realize that they do not contribute to a better understanding of biodiversity (Dance, 1970; Reischütz, 1994). However, as one can see from our CLECOM list, we have evaluated the numerous taxa recognized by the "Nouvelle École" of Bourguignat or the Starobogatov doctrine and found most taxa not to be taxonomically sound. Thus, only a few names have entered our lists. We would like to stress once more, that we have critically investigated, case by case, the evidence on which a morphospecies has been based before we decided to accept it in our check-list. So we did exactly what Davis describes as the necessary methodological procedure: sort through publications, look at voucher specimens and field records (in order to assess the biological validity of formally described taxa), consider contradictory information, make decisions, and ensure compliance with the International Code of Zoological Nomenclature. We agree with Davis that there is some subjectivity in this procedure. This subjectivity is likely to be minimized through the collaboration of independent specialists: as clearly stated in the introduction, the CLECOM check-list is not the product of a single person. We hope that Davis does not expect us to be in-

fallible. Of course, errors, wrong decisions, and omissions happened; and sometimes – to spare time – we were not critical enough and relied on secondary literature of which we judged the authors to be thorough and reliable. To correct such errors and to include new findings we formally institutionalised the instrument of Updates for the CLECOM-lists, of which the first appeared in 2001 (Bank et al., 2001b) and the second is now ready for printing.

The Use of Subspecies

It is well-known that many species vary in space. They may consist of (groups of) recognizable populations inhabiting different geographical areas. Such populations may have been initially described as separate species. They are combined as polytypic species, objectively whenever hybrid zones connect the diagnosable population groups, or subjectively on the – weak indeed – basis of similarity and analogy to comparable cases. In land snails the subspecies concept has resulted in a decrease in the number of so-called species. Given the importance of the polytypic species concept, it is remarkable that it is widely ignored in faunistic studies (but often not in taxonomical work!). Davis (2004: 229) argues that a check-list that is based on faunistic literature should ignore subspecies, as in faunistic literature the subspecies is widely neglected. However, our check-list is based on taxonomic literature. We see no good reason to ignore the subspecies level of biodiversity in faunistic studies. Subspecies in the BSC are terminal taxa in the phylogenetic species concept (see the response of Bouchet, 2006).

Too Many (Sub)Species?

Some authors feel uncomfortable about the large number of species and subspecies mentioned in the CLECOM list or in the Fauna Europaea database. An example is the large list of Clausiliidae from Greece. However, molecular data on some of the most speciose genera are in agreement with the large radiations that were unraveled by morphological studies (Schilthuizen, 1994; Moorsel, 2001; Uit de Weerd, 2004). The diversification of the helcid genus *Arianta*, based on morphological features and postulated over a decade ago (Gittenberger, 1991), has now been confirmed by molecular data (Gittenberger et al., 2004). Species complexes within the Arionidae, rec-

ognized on the basis of morphological and anatomical characters, are becoming confirmed by molecular data as well (Pinceel et al., 2004). We thus feel that in the vast majority of cases the CLECOM list reflects the biodiversity of continental molluscs as present in Europe. Of course, gaps in our knowledge will certainly result in incomplete or wrong data in our list. The list can only be as good as the science on which it is based. We still have a long way to go to achieve a complete assessment of the actual snail diversity of Europe. Currently, some 25 new (sub)species are described on a yearly basis from Europe: on average one new taxon every two weeks.

The Case of *Bythiospeum*

Bythiospeum is admittedly a major problem in the faunal lists (and Red Lists) of Germany in general and the federal states of Baden-Württemberg and Bayern in particular, which hampers the evaluation of the fauna with respect to its degree of endemism and the fixation of conservation priorities. So far, 58 names have been introduced to designate the different forms of *Bythiospeum* in Germany. The validity of these nominal taxa has been a matter of intensive discussion, but so far no consensus has been reached (also not among the CLECOM authors!). Obviously however, the three polytypic species complexes of Bolling (1966) are not a reflection of the true amount of differentiation in this genus in Germany. Nevertheless, Bolling was followed in the successive editions of the freshwater mollusc guide of Glöer et al. (1978–1992) and Glöer & Meier-Brook (1994–2003). Perpetuation of that practice was considered by us as unacceptable. We also did not follow the example of Boeters (1998), who simply provided a list of all available names. Although this exhaustive listing has the advantage of being objective, it is purely technical and by definition excludes any modification or incorporation of new biological results with the exception of the addition of new names. Such a list is surely useful but is not compatible with our aim of depicting “real world” biological diversity.

We will explain how we established the list of *Bythiospeum* taxa as presented in our CLECOM list. First, we accepted the hypothesis of Geyer (1908) that in several species parallel converging dwarf forms occur, which may be so different from their stem form that they give the impression of being distinct spe-

cies (in some cases syntopic occurrences of distinct species may really be hidden under this phenomenon). Second, we took into account the fact that several species can be clearly distinguished by their anatomy. In this context, it is of interest to note that the three species that are differentiated by Boeters (1984) were regarded by Bolling (1966) as belonging to one "species" (*acicula* sensu Bolling) and that two of them (*suevicum* and *exiguum*) represented his subspecies *clessini*. This shows that even a provisional maintenance of Bolling's system was impossible. In the Bavarian alpine foreland, *B. acicula* and *B. heldii* (occurring in the same hydrological system at Obernach on the Walchensee) are anatomically separable (Boeters, 2002). The other nominal species occurring in the Bavarian alpine foreland, namely *rougemonti*, *carychiodes*, *aciculoides* and *algotiensis*, were considered provisionally by us as synonyms of *acicula* or *heldii*; *B. alzenze* was considered a separate species. For Baden-Württemberg, we accepted in general the classification of Geyer (1908), being the result of extensive and carefully planned fieldwork by Geyer, producing a hitherto unsurpassed wealth of material. The classification system was elaborated by Geyer in a self-critical way following the modern species concept (i.e., anticipating the biological species concept). He based his revision on thorough conchological examination but also stressed the need for anatomical studies. From his papers, it is clear that Geyer recognised variability and ecophenotypic variation, and that he had well-founded ideas on geographical barriers and the genetical coherence of populations. Geyer was also aware of the pitfalls of Bourguignatism, which he rejected: "Ich ... hütete mich aber vor der Art der neufranzösischen Schule, welche den Lebenszusammenhang mißachtet" (1908: 595). In our opinion, the work of Geyer is the best that has ever been done on *Bythiospeum* and we see no reasons to abandon his system, which is scientific because it allows falsification and amendment. We have revalidated *Bythiospeum pellucidum*, the type-species of the genus, which was shown by Boeters (1984) to be a good species, different from *B. quenstedti* to which it had been attributed by Geyer as a mere ecophenotype (Geyer, who named the species with inclusion of its alleged derivative *quenstedti*, was apparently unaware of the nomenclatural consequences, as were all his

followers). Other deviations from Geyer are: (1) we neglected all subspecies that could not be attributed to geographical regions or were said to occur side by side in the same cave or spring; (2) we treated *lamperti*, *taxisi*, and *senefelderi* as full species, following Ehrmann (1933); (3) for Mainfranken, we followed the concept of two species (*clessini* and *puerkhaueri*) with several subspecies and provisionally treated *moenanum*, *elongatum* and *nolli* as synonyms, based on Noll & Hässlein (1952).

In summary, we rejected the *Bythiospeum* species constructs of Bolling and adopted the more traditional (non-Bourguignatian) classification of Geyer (1904–1908) with modifications based on arguments of later authors. Taking into account the relevant literature on this topic, we listed for Germany 26 species, 6 of them polytypic (a total of 36 names). We have thus "neglected" (synonymised) 22 names. This will certainly be the subject of further changes after additional research. But it remains to be demonstrated – by DNA sequencing for example – whether this is indeed a case of "splitting". In this context, it is of interest to note that Haase (1995), after a detailed morphometric study of the then eight recognized *Bythiospeum* taxa from Austria, accepted them all (albeit provisionally) as separate species.

Value of Molecular Data: Systematics of Hydrobiidae as an Example

We acknowledge the great value of molecular data for systematic work and, as a consequence, also for check-lists, and have used these data whenever possible. We are surprised to learn from Davis that we have ignored the molecular work from his group. He writes (2004: 230) "... the molecular work my group has done in the past ten years on several European taxa in the superfamily Rissooidea largely has been ignored by CLECOM. Instead, the rissooidean systematics of that list is still mainly based on traditional (mostly shell-based) data. It is not that the molecular data have been ignored, because they often contradict the findings of members of the CLECOM team. Rather, it is important that CLECOM incorporates new findings based on genetic data much more quickly, even if these findings are inconvenient". First, we would like to stress that our classification is not mostly shell-based but mainly based on

anatomical characters, namely on the genital organs from a large number of genera (as provided by Radoman, 1983). Second, we are well aware of the excellent work of Davis and co-workers on Rissooidea, and have integrated their results in our check-list. So we are eager to learn, where our list deviates from his work published *before* the beginning of 2001, the year that our list was published. Unfortunately, no example(s) is(are) given. An interesting paper by Wilke et al. (December 2001), with Davis as one of the authors, described the molecular systematics of the Hydrobiidae. This paper is the most recent work of Davis dealing with the classification of a part of the European taxa generally assigned to the Hydrobiidae. Interestingly, the presented classification essentially reflects the classification used by CLECOM. We noted the following differences: the Lithoglyphidae, Cochliopidae and Amnicolidae are dealt with by CLECOM as subfamilies within the Hydrobiidae, rather than families. As already stated by Wilke et al. (2001: 11), "There is no universal definition for "family". In this context, it is of interest to note, that Davis et al. (1982, 1985) ranked these families, as CLECOM did, before 2001 as subfamilies. Thus, we "lumped" rather than "split" the suprageneric hierarchical units: certainly no revival of the "Nouvelle École"!

The subdivision of Hydrobiidae into several clades by Wilke et al. (2001) (that is, the maximum likelihood tree based on combined COI and 18S sequences – their fig. 3), also essentially reflects our classification. *Adrioin sulana*, *Pseudamnicola*, *Adriohydrobia*, *Hydrobia*, *Peringia* and *Ventrosia* [correct name: *Ecrobia*] cluster together, separate from *Graziana*, *Belgrandia*, *Horatia*, *Sadleriana*, *Orientalina*, *Hauffenia*, *Fissuria*, *Alzoniella*, *Avenionia* and *Islamia*. These two clades are designated Hydrobiinae and Belgrandiinae, respectively, in our classification. The only two surprises in their figure 3 are (1) *Mercuria*, which we classified within the Hydrobiinae, not Belgrandiinae, and (2) the classification of *Bythiospeum* within the Moitessieriidae. With respect to *Bythiospeum*, there are massive anatomical data suggesting that *Bythiospeum* and *Moitessieria* are not closely related (Boeters, 1972; Boeters & Gittenberger, 1990; Boeters, 2003). Unfortunately, the sequences are based on an unidentified "*Bythiospeum* spec." collected in southern France, which does not allow verification of the diagnostic

characters given by Boeters (2003). The family status of the Moitessieriidae itself has been defended by some authors for many years and denied by others: here DNA demonstrates its value. All this shows the importance of a good (morphological) taxonomic framework to start with. Incorrect identifications result in wrong conclusions. With respect to *Mercuria*, we noticed that in the maximum likelihood tree based on the mitochondrial COI only (their fig. 2B), *Mercuria* seems to be more closely related to the Hydrobiinae than to the Belgrandiinae, whereas in the maximum likelihood tree based on the nuclear 18S (their fig. 2A) the reverse is seen. This is a good example of the well-known fact that gene trees and phylogenetic trees may differ significantly from one another. What is needed is an integrated approach. It is this approach that was used while preparing the CLECOM check-list.

LITERATURE CITED

- ALBA, D. M., A. TARRUELLA, J. CORBELLÀ, M. VILELLA, G. GUILLÉN, L. PRATS & J. QUINTANA, 2004, Addenda a la llista dels mol·luscos continentals de Catalunya. *Spira*, 1 (4): 1–10.
- BANK, R. A., P. BOUCHET, G. FALKNER, E. GITTENBERGER, B. HAUSDORF, T. VON PROSCHWITZ & T. E. J. RIPKEN, 2001a, Supraspecific classification of European non-marine Mollusca (CLECOM sections I + II). *Heldia*, 4: 77–128.
- BANK, R. A., K. GROH & T. E. J. RIPKEN, 2002, Catalogue and bibliography of the non-marine Mollusca of Macaronesia. In: M. FALKNER, K. GROH & M. C. D. SPEIGHT, eds., *Collectanea Malacologica*. Festschrift für Gerhard Falkner. Friedrich-Held-Gesellschaft/ConchBooks, München/Hackenheim. pp. 89–235, pls. 14–26.
- BANK, R. A., G. FALKNER, H. NORDSIECK & T. E. J. RIPKEN, 2001b, CLECOM-Project. First update to systematics and nomenclature of the CLECOM-checklists, including corrigenda et addenda to the printed Lists. *Heldia*, 4 (1/2), Supplement: A1–A6.
- BOETERS, H. D., 1972, Westeuropäische Moitessieriidae, 1. *Spiralix* n. subgen. (Prosobranchia). *Archiv für Molluskenkunde*, 102: 99–106.
- BOETERS, H. D., 1984, Gedanken zu einer Revision der Gattung *Bythiospeum* in Deutschland. *Mitteilungen der deutschen malakozoologischen Gesellschaft*, 37: 142–171.
- BOETERS, H. D., 1998, Mollusca: Gastropoda: Rissooidea. *Süßwasserfauna von Mitteleuropa* 5/1–2: ix + 76 pp.
- BOETERS, H. D., 2002, Ein Beitrag zu *Bythiospeum* im Einzugsgebiet der Isar in Oberbayern. In: M. FALKNER, K. GROH & M. C. D.

- SPEIGHT, eds., *Collectanea Malacologica*. Festschrift für Gerhard Falkner. Friedrich-Held-Gesellschaft/ConchBooks, München/Hackenheim, pp. 21–31.
- BOETERS, H. D., 2003, Supplementary notes on Moitessieriidae and Hydrobiidae from the Iberian Peninsula (Gastropoda, Caenogastropoda). *Basteria*, 67: 1–41.
- BOETERS, H. D. & E. GITTENBERGER, 1990, Once more on the Moitessieriidae (Gastropoda Prosobranchia), with description of *Clameia brooki* gen. et spec. nov. *Basteria*, 54: 123–129.
- BOLLING, W., 1966, Beiträge zum Problem des Genus *Bythiospeum* Bourguignat (Mollusca - Hydrobiidae). *Bericht der Naturforschenden Gesellschaft Bamberg*, 40: 21–102.
- BOUCHET, P., 2006, VALID UNTIL SYNONY-MIZED, OR INVALID UNTIL PROVEN VALID? A RESPONSE TO DAVIS ON SPECIES CHECK-LISTS. *Malacologia*, 48: 311–319.
- CAMERON, R. A. D., 2003, Land snails in the British Isles. *Field Studies Council Occasional Publication*, 79: iii + 82 pp.
- DANCE, S. P., 1970, "Le fanatisme du nobis": a study of J.-R. Bourguignat and the "Nouvelle École". *Journal of Conchology*, 27: 65–86.
- DAVIS, G. M., 2004, Species check-lists: death or revival of the Nouvelle École? *Malacologia*, 46: 227–231.
- DAVIS, G. M. & M. MAZURKIEWICZ, 1985, Systematics of *Cincinnati winkleyi* (Gastropoda: Hydrobiidae). *Proceedings of the Academy of Natural Sciences of Philadelphia*, 137: 28–47.
- DAVIS, G. M., M. MAZURKIEWICZ & M. MANDRACCHIA, 1982, *Spurwinkia*: morphology, systematics, and ecology of a new genus of North American marshland Hydrobiidae (Mollusca: Gastropoda). *Proceedings of the Academy of Natural Sciences of Philadelphia*, 134: 143–177.
- EHRMANN, P., 1933, Mollusca. *Die Tierwelt Mitteleuropas*, 2 (1): 264 pp., 13 pls.
- FALKNER, G., R. A. BANK & T. VON PROSCHWITZ, 2001, Check-list of the non-marine molluscab species-group taxa of the states of Northern Atlantic and Central Europe (CLECOM I). *Heldia*, 4: 1–76.
- FORCART, L., 1956, Die Taxonomie und Nomenklatur der als *Succinea elegans* und *Succinea pfeifferi* bekannten Bernstein-schnecken. *Archiv für Molluskenkunde*, 85: 15–17.
- GEYER, D., 1904, Beiträge zur Vitrellenfauna Württembergs. [I]. *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg*, 60: 298–334, pls. 8–14.
- GEYER, D., 1905a, Von der Eger zur Prim. Eine Quellenreise. *Blätter des schwäbischen Albvereins*, 17 (6): 191–193; (7): 225–230; (8): 257–64.
- GEYER, D., 1905b, Beiträge zur Vitrellenfauna Württembergs II. *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg*, 61: 289–301, pls. 4–7.
- GEYER, D., 1906, Beiträge zur Vitrellenfauna Württembergs III. (Zugleich eine Erwiderung.) *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg*, 62: 189–200.
- GEYER, D., 1907, Beiträge zur Vitrellenfauna Württembergs. IV. *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg*, 63: 285–417, pls. 4–6.
- GEYER, D., 1908, Die Lartetien (Vitrellen) des süddeutschen Jura- und Muschelkalkgebietes. *Zoologische Jahrbücher (Systematik)*, 26: 591–620, pls. 34–35.
- GITTENBERGER, E., 1991, Altitudinal variation and adaptive zones in *Arianta arbustorum*: a new look at a widespread species. *Journal of Molluscan Studies*, 57: 99–109.
- GITTENBERGER, E., W. H. PIEL & D. S. J. GROENENBERG, 2004, The Pleistocene glaciations and the evolutionary history of the polytypic snail species *Arianta arbustorum* (Gastropoda, Pulmonata, Helicidae). *Molecular Phylogenetics and Evolution*, 30: 64–73.
- GLOER, P., 2002, Die Süßwassergastropoden Nord- und Mitteleuropas. Bestimmungsschlüssel, Lebensweise, Verbreitung. *Die Tierwelt Deutschlands*, 73: 327 pp.
- GLOER, P., C. MEIER-BROOK & O. OSTERMANN, 1978 [1980–1992], *Süßwassermollusken. Ein Bestimmungsschlüssel für die Bundesrepublik Deutschland* [1. Auflage]. Deutscher Jugendbund für Naturbeobachtung, Hamburg [successive editions: 1980, 1982, 1983, 1985, 1986, 1987, 1989, 1990, 1992].
- GLOER, P. & C. MEIER-BROOK, 1994 [1998, 2005], *Süßwassermollusken. Ein Bestimmungsschlüssel für die Bundesrepublik Deutschland*, 11. Auflage. Deutscher Jugendbund für Naturbeobachtung, Hamburg [successive editions: 1998, 2003].
- HAASE, M., 1995, The stygobiont genus *Bythiospeum* in Austria: a basic revision and anatomical description of *B. cf. geyeri* from Vienna (Caenogastropoda: Hydrobiidae). *American Malacological Bulletin*, 11: 123–137.
- LEE, M. S. Y., 2004, The molecularisation of taxonomy. *Invertebrate Systematics*, 18: 1–6.
- MARTÍNEZ-ORTÍZ, A. & F. ROBLES, 2003, Molluscs continentales de la Comunidad Valenciana. Valencia (Generalitat Valenciana Consellaria de Territori i Habitatge). 259 pp.
- MOORKENS, E. & M. C. D. SPEIGHT, 2001, The CLECOM project list of Irish non-marine Mollusca. *Bulletin of the Irish Biogeographical Society*, 25: 95–104.
- MOORSEL, C. H. M. VAN, 2001, *Molecular phylogenetics of a speciose group: Albinaria and the search for homology*. Ph.D. thesis, University Leiden. 120 pp.
- NOLL, W. & L. HÄSSLEIN, 1952, Ergebnisse der mainfränkischen Lartetienforschung im Jahr 1951. *Nachrichtenblatt des Naturwissenschaftlichen Museums Aschaffenburg*, 34.
- OLSEN, K. M., 2002, Landsnegler i Norge – en oppsummering og en presentasjon av tre nye arter, *Oxychilus navarricus* (Bourguignat,

- 1870), *Lucilla singleyana* (Pilsbry, 1890) og *Hawaiiia minuscula* (Binney, 1840). *Fauna*, 55: 66–77.
- PINCEEL, J., K. JORDAENS, N. VAN HOUTTE, A. J. DE WINTER & T. BACKELJAU, 2004, Molecular and morphological data reveal cryptic taxonomic diversity in the terrestrial slug complex *Arion subfuscus/fuscus* (Mollusca, Pulmonata, Arionidae) in continental north-west Europe. *Biological Journal of the Linnean Society*, 83: 23–38.
- RADOMAN, P., 1983, Hydrobioidea a superfamili of Prosobranchia (Gastropoda). I. Systematics. *Monographs Serbian Academy of Sciences and Arts*, 547: 1–256.
- REISCHÜTZ, P. L., 1994, Ist Starobogatovismus die Steigerung von Bourguignatismus? Beiträge zur Molluskenfauna Niederösterreichs, XI. *Nachrichtenblatt der Ersten Vorarlberger Malakologischen Gesellschaft*, 2: 51–52.
- SCHILTHUIZEN, M., 1994, *Differentiation and hybridisation in a polytypic snail*. Ph.D. thesis, University Leiden. 178 pp.
- ŠTEFFEK, J. & J. GREGO, 2002, The checklist of molluscs (Mollusca) occurring in Slovak Republic. *Acta Universitatis Mathiae Belii, Séria environmentálna Ekológia*, 2: 60–69.
- STEINKE, D., C. ALBRECHT & M. PFENNINGER, 2004, Molecular phylogeny and character evolution in the western Palaearctic Helicidae s.l. (Gastropoda: Stylommatophora). *Molecular Phylogenetics and Evolution*, 32: 724–734.
- UIT DE WEERD, D. R., 2004, *Molecular phylogenetic history of eastern Mediterranean Alopinae, a group of morphologically indeterminate land snails*. Ph.D. thesis, University Leiden. 119 pp.
- VILELLA, M., A. TARRUELLA, J. CORBELLA, L. PRATS, D. M. ALBA, G. GUILLÉN & J. QUINTANA, 2003, Llista actualitzada dels mol·luscos continentals de Catalunya. *Spira*, 1(3): 1–29.
- WHEELER, Q. D., 2004, Taxonomix triage and the poverty of phylogeny. *Philosophical Transactions of the Royal Society of London, Series B*, 359: 571–583.
- WIENS, J. J., 2004, The role of morphological data in phylogeny reconstruction. *Systematic Biology*, 53: 653–661.
- WILKE, T., G. M. DAVIS, A. FALNIOWSKI, F. GIUSTI, M. BODON & M. SZAROWSKA, 2001, Molecular systematics of Hydrobiidae (Mollusca: Gastropoda: Rissooidea): testing monophyly and phylogenetic relationships. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 151: 1–21.
- WILL, K. K. & D. RUBINOFF, 2004, Myth of the molecule: DNA bar codes for species cannot replace morphology for identification and classification. *Cladistics*, 20: 47–55.

Revised ms. accepted 22 August 2005